LAB NEWS

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Value in Field Audits

By Peter Kozelka

As an EPA employee that uses environmental data in decision making, you need assurance that the data are correct or of good quality. The outcome of the quality of data begins in the field when the sample is collected. As part of the process to ensure good data quality, the Region 9 Lab Field Services Team performs field audits.

Field audits have considerable value. They: a) verify that the appropriate sampling techniques are being used; b) provide instruction and guidance on new EPA recommendations; c) ensure sample integrity at the time of collection; d) reduce vulnerability of the quality assurance program.

Field audits can be triggered by any of these indicators: unique sampling strategies, unusual matrices, large numbers of samples, political issues, collection of "sensitive" samples from a highly public site, frequent sampling by support contractors, deviations from established sampling protocols or poorly prepared sampling plans as identified by the Quality Assurance Program staff.

EPA R9 Field Team members have audited samplers' performance collecting samples from a variety of media: soil gases, groundwater, surface water, drinking water, sediments and (dry) soils. The analytes of concern in these samples often require specific sampling procedures. For example, volatile organic compounds (VOCs) are commonly targeted analytes in groundwater and soils. Detailed methods for collecting VOCs have been outlined and should be performed to ensure these volatile compounds are not "lost" during the sampling stage.

(See Field, pg. 2)

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Bioassays as Indicators of Biological Effects

By Amy Wagner

One of the reasons that we monitor the environment is to assess the potential for adverse impacts on organisms. Traditionally, assessments are made based on chemical analyses of water or sediments of concern. The analytical results are then compared to established water quality or sediment criteria. Detecting the potential for harm is then dependent upon analysis for the correct chemical and having an established criteria for that chemical.

A different approach to impact assessment is to expose living organisms directly to waters or sediments of concern. Toxicity tests, or bioassays, measure the relative toxicity of samples to a particular organism. Organism mortality, growth, reproduction and developmental abnormalities are some of the endpoints measured as indicators of toxicity. Toxicity tests do not indicate what specific substances are present or in what concentrations. However, they can be used to assess the potential for biological harm from any sample.

The toxicity testing procedure uses either a whole sample or several dilutions of the sample (i.e. 6.25%, 12.5%, 25%, 50%, 100%). Several replicates of each concentration are placed in individual test containers each with a specific number of test organisms. Since toxicity is a relative measure, the sample results must be compared to a "clean" sample, or control. Controls not only serve as a source for comparison; they also assess the acceptability of the test because the organisms' health must be within a range of acceptability criteria (for survival, reproduction, development, growth) in the controls. Controls are usually water or sediment samples obtained from a clean source that are basically free of contaminants. The Region 9 Laboratory's control seawater comes from a pipeline into the Bodega Marine Laboratory, an area where there are very few sources of contamination. It is delivered to the Laboratory by a truck monthly. For freshwater tests, we prepare control water by adding salts to vary hardness and alkalinity as required. Control sediments are made from a mixture of clays and sands essentially free of contaminants. To assure quality control during testing, concurrent reference toxicity tests are always conducted. This involves repeatedly testing the toxicity of one chemical compound (i.e. copper sulfate) at the same concentrations with the same type of test organism. Comparisons to an established normal

(See Toxicity, pg.2)

From the Director

By Brenda Bettencourt

The EPA Region 9 Laboratory provides a variety of field sampling, field oversight, and analytical services, as well as technical assistance and specialized training on field sampling and analytical procedures. State, tribal, and local entities with grants from EPA for environmental programs can access these services by placing a request through their EPA grant Project Officer.

To request assistance from the Region 9 Laboratory you can contact me for a referral to the correct staff, you can request a contact list from our receptionist (510) 412-2300, or for analytical assistance only, you can contact Gail Jones, the Regional Sample Control Coordinator, who works in the Regional Office in the Quality Assurance Program (4-1498). In general, all projects funded by EPA that involve environmental measurements must have approved quality assurance documentation in place before environmental sampling and analysis take place. If the Regional Lab is unable to perform the analyses that are needed for your project, Gail can assist you in finding other alternatives, some of which may not require additional funding from your program.

The Region 9 Lab is staffed by a combination of EPA staff, SEE grantees and contractors. The primary source of funding for the contractor is Superfund, however the region can add non-Superfund money to the contract which allows the contractor to perform analyses for other programs. This enables the lab to perform a wide array of analytical services for all of EPA's programs.

CONTRIBUTORS

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(**Toxicity, cont**.)
range indicate variability in sensitivity of the test organism to the toxicant and determine reproducibility of the test.

Which test organism is the right one to use to evaluate a particular sample? If the cause of toxicity is unknown, it is wise to use a vertebrate (ie. fish), invertebrate (ie. crustacean), and a plant (ie. seaweed, microscopic algae) to screen the sample, since chemicals can impact each type of organism differently. When we have some information about the chemicals that may be present in a sample, we will use an organism that has a particular sensitivity to that chemical or group of chemicals. For example, if a pesticide is the suspected contaminant in a fresh water sample, the water flea (*Ceriodaphnia*) is the organism of choice for testing. This is because the microcrustacean is closely related to insects; since pesticides are designed to kill insects, *Ceriodaphnia* is the most appropriate aquatic organism to use.

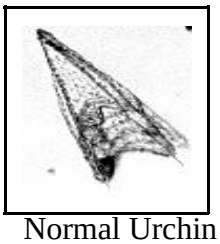
The Region 9 Laboratory used *Ceriodaphnia* to test river water from REMAP (Regional Environmental Monitoring and Assessment Program) sites in the Central Valley to determine whether pesticides from farms were impacting the water quality in adjacent streams. The advantage of using these organisms is that the laboratory-cultured populations start with females that reproduce by cloning themselves. Each female begins producing young at 3 to 4 days old, and during the course of the 7-day test, the number of young produced can be counted to determine whether a toxicant in the sample is inhibiting reproduction when compared to the control.

The Laboratory has performed three-species freshwater toxicity tests on split samples for the Grassland Bypass Monitoring Program in California's Central Valley. The tests involve 7-day exposures of fathead minnows (fish), 7-day exposures of *Daphnia* (invertebrate), and 4-day exposures of *Selenastrum* (green algae). The tests are conducted to monitor potential effects of agricultural drainage water on survival, growth and reproduction of freshwater species. Testing the same water sample with the same species used by the contracting laboratory is one way to assure that the results are comparable.

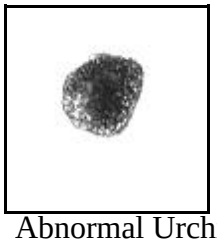
The Region 9 Laboratory has also conducted estuarine and marine toxicity tests on samples from San Francisco Bay Superfund sites such as Concord Naval Weapons Station and Hunters Point Annex. We conducted toxicity tests by exposing amphipods directly to sediment samples. After 10 days of burrowing in the sediment samples, the surviving amphipods in sieved sediments were counted and their ability to rebury in control sediment was determined. Pore water squeezed from sediments by centrifugation was also tested to determine whether the bioavailable portion of the sediment was toxic. We exposed fertilized eggs of purple sea urchins to pore water solutions and allowed the urchins to develop for 3 days. Hundreds of microscopic urchins were examined to determine whether their development was impaired by toxicants. As you can see in the pictures, some samples were clearly toxic to urchin development.

How do we quantify how much toxicity is too much? This depends upon the program or goals of the study. We normally use statistical analyses to quantify the magnitude and significance of toxicity. Tests conducted for the NPDES (National Pollution Discharge Elimination System) program often use a No Observable Effect Concentration (NOEC) to determine whether the effluent meets the permit limit. The NOEC is the effluent concentration that causes no statistically significant difference from the control. Other studies look for a statistically significant difference between the sample and the control. After analyzing the data statistically, we can start looking for the cause of the toxic response and to link the response with toxic chemicals that were found in the same sample.

To obtain a list of tests that the Biology Team is capable of conducting presently, contact Peter Husby (510-412-2331) or Amy Wagner (510-412-2329).



Normal Urchin Larva



Abnormal Urchin Larva

(Field, cont.)
What is your role?
Any EPA employee can initiate the field audit by contacting the Region 9 Laboratory. We will need background information and the field sampling plan. We also need to know of specific concerns about the site and the sampling techniques. More often than not, the field audit is arranged with a minimum of two weeks notice. In some cases, the field audit can be unannounced although those events are rare and require justification.

What can you expect when you request a field audit?
We set a date (min. two weeks later) for the field audit with the sampler. We familiarize ourselves with the field sampling plan and the site health and safety plan prior to the audit. We conduct the audit by evaluating the samplers' performance in comparison to their field sampling plan and to current EPA recommendations for sampling protocol. We provide some instruction although we do not interrupt the sampling process unless

there are gross errors. Once we complete the audit (one or two days), we give a verbal review to the sampler prior to leaving the site. We then compile a complete description of the audit and report to the requestor within 17 calendar days.

The Field Services Team is composed of Pat Mack (Team Leader), Liza Finley, Peter Kozelka, Mario Castillo, Ted McEwen and Arthur Milton. Our field expertise can complement your concerns when it comes to collecting a "representative" environmental sample.

Laboratory Contact List

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Gail Jones: 4-1498

Sample collection, Split sampling, Sampling audits:
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